

BIOTECHNOLOGY

PAPER 2

(PRACTICAL)

(Maximum Marks: 30)

(Time allowed: Three hours)

(Candidates are allowed additional 15 minutes for **only** reading the paper.
They must **NOT** start writing during this time.)

Answer **all** questions.

The intended marks for questions or parts of questions are given in brackets [].

Question 1

- (a) You are provided with a milk sample, labelled **M**.

Take 25 ml of the sample **M** in a 100 ml beaker and add 25 ml of distilled water to it. Warm the sample in a water bath set at 37°C for 5 minutes. Remove the beaker from the water bath and record the pH of the sample using pH paper. Next, add 0.4N HCl to the beaker drop by drop and stir the mixture continuously until the milk begins to precipitate. Note the pH at which maximum precipitation of milk sample occurs. Filter the precipitate, using muslin cloth.

Answer the following questions:

- (i) Report the initial pH of the milk sample at 37°C and the pH at which maximum precipitation of the milk sample occurs. [1]
- (ii) Name the reducing sugar present in the above sample. Also, name the precipitate obtained in the experiment. [1]
- (iii) Explain the basic principle involved in the above experiment. [1]
- (b) You are given two solutions, labelled **A** (0.2 M boric acid) and labelled **B** (0.2 M sodium borate). Take two beakers (250 ml each) and label them **X** and **Y**. Pour 50 ml of solution **A** into both of these beakers. Perform the given experiment and answer the questions that follow.

To beaker **X**, add 2 ml of solution **B**. Make the volume to 200 ml by adding distilled water and mix it thoroughly. Note the pH of the solution by using pH paper.

To beaker **Y**, add 30 ml of solution **B**. Make the volume to 200 ml by adding distilled water and mix it thoroughly. Note the pH of the solution by using pH paper.

Add 2 – 4 drops of dil. NaOH to the mixture in each of the two beakers **X** and **Y**. Mix them thoroughly and note the pH for both the beakers, **X** and **Y**.

Write your observations in your answer script in a tabular form as shown below:

Solution in beaker	pH
X	
Y	
X with NaOH added	
Y with NaOH added	

Based on your above observations, answer the following:

- (i) What is the nature of mixture in the two beakers **X** and **Y**? [1]
- (ii) Explain how a buffer solution resists small changes in pH. [1]
- (iii) Give *two* examples where the buffer solution is used in laboratory. [1]

Question 2

You are provided with solution **S** and solution **E**. Proceed as follows:

Take three test tubes, mark them as **S**₁, **S**₂ and **S**₃ and pour 2 ml of solution **S** into each of them. Next, take two test tubes, mark them as **E**₁ and **E**₂. Pour 2 ml of solution **E** into each of these test tubes.

To the test tube **S**₃ add 2 to 3 drops of iodine solution. Mix well and note the colour change.

Place the test tubes **S**₁ and **E**₁ in a water bath set at 37°C. Keep test tubes **S**₂ and **E**₂ in another water bath set at 90°C. Allow the test tubes to incubate in water bath for 15 minutes.

Remove all the four test tubes **E**₁, **E**₂, **S**₁ and **S**₂ from the water baths.

Pour the solution from the test tube **E**₁ into test tube **S**₁ and mix it well.

Pour the solution from test tube **E**₂ into test tube **S**₂ and mix it well.

Allow the test tubes **S**₁ and **S**₂ to stand for 10 minutes.

Add 2 to 3 drops of iodine solution to each of the test tubes **S**₁ and **S**₂ and observe the change in colour.

Show the colour change observed in test tubes **S₁, **S**₂ and **S**₃ at the end of the experiment, to the Visiting Examiner.**

Answer the following questions:

- (i) What is the colour change in test tube S₃? Give the reason for the colour change. [1]
- (ii) Report your observation and inference for the test tubes S₁ and S₂ in a tabular form as given below: [2]

Solution in test tube	Observation	Inference
S ₁		
S ₂		

- (iii) Identify solution S and solution E on the basis of the above tests. [1]
- (iv) What is the aim of this experiment? [1]

Question 3

Identify the displayed instruments / photographs of the instruments labelled **1 to 4**.
For each instrument write:

- (a) The name of the instrument [2]
- (b) One specific use of the instrument. [2]

Question 4

Show the following to the Visiting Examiner for assessment.

- (a) Project. [10]
- (b) Biotechnology Practical File. [5]